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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/724,791

12/01/2003

Michael B. Korzenski

ATMI-686

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02/13/2006

ATMI, INC.

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EXAMINER

UMEZ ERONINI, LYNETTE T

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 02/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/724,791

Applicant(s)

KORZENSKI ET AL.

Examiner

Lynette T. Umez-Eronini

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 November 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7,9 and 11-14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7,9 and 11-14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12/1/2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This communication is in response to Applicants' Remarks in Amendment, filed 11/23/2006, which were persuasive in showing the formerly applied reference of Xu (US PG PUB 2003/0125225) disqualifies as prior art under 103(a) in the rejection of claims of the pending application. New art, which teaches Applicants' composition that "comprises at least one bifluoride compound . . .," as recited in (Currently amended) claim 1 has been found and new rejection is made.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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3. Claims 1-7, 9, 11-12, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vaartstra (US 6,149,828) in view of Mullee (US 6,306,564 B1).

Vaartstra teaches exposing a substrate to a supercritical etching composition to remove inorganic material that includes silicon and silicon dioxide (column 3, lines 17-23). The supercritical etching composition includes alcohols (same as applicants' co-solvent), carbon dioxide and inert gases (e.g., He, Ne, Ar); etching components such as hydrofluoric acid, acetic acid; and surfactants (column 3, line 44 – column 4, lines 7), which reads on,

A sacrificial silicon-containing layer etching composition, comprising a supercritical fluid (SCF), at least one co-solvent, at least one etchant species, and optionally at least one surfactant, **in claim 1**;

wherein the SCF comprises a SCF species selected from the group consisting of carbon dioxide, oxygen, argon, krypton, xenon, and ammonia, **in claim 2**;

wherein the SCF comprises carbon dioxide, **in claim 3**;

wherein the sacrificial silicon-containing layer comprises a silicon-containing species selected from the group consisting of silicon oxide and silicon nitride, **in claim 7**; and

wherein the sacrificial silicon-containing layer consists essentially of silicon, **in claim 14**.

Vaartstra differs in failing to teach wherein the etchant species comprises at least one bifluoride compound selected from the group consisting of ammonium bifluoride, tetraalkylammonium difluoride ((R)₄NHF₂), and alkyl phosphonium difluorides

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$((R)_4PHF_2)$, wherein R is a C₁-C₄ alkyl group, **in claim 1**; wherein the etchant species comprises ammonium bifluoride, **in claim 9**; wherein the co-solvent comprises at least one C₁-C₆ alcohol, **in claim 4**; wherein the co-solvent comprises methanol, **in claim 5**; and wherein the co-solvent comprises isopropanol, **in claim 6**.

Mullee teaches a stripping chemical comprising: supercritical CO₂, and one or more chemicals such as ammonium bifluoride in removing resist, residue, or other contaminants on a wafer (column 3, line 67 – column 4, line 39). Mullee also teaches other chemicals such as an organic solvent that includes for example, an alcohol, methanol, ethanol, or isopropanol, which may be used independently or added to remove organic contaminants from a wafer surface (column 4, lines 21-28), and may be introduced in an amount from 0.1 to 15% v_o/v_v (column 4, lines 28-32).

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Vaartstra's composition by employing alcohols as specified by and ammonium bifluoride as taught by Mullee because using ammonium bifluoride along with organic and /or inorganic stripping solvent(s) supported by supercritical CO₂ is known to effect the removal of contaminants from a wafer surface (Mullee, column 1, lines 9-14).

4. Claims 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vaartstra (US '828) in view of Mullee (US '564 B1) as applied to claim 1 above, and further in view of Wilkinson et al. (US 5,789,505).

Vaartstra in view of Mullee differ in failing to teach wherein the surfactant comprises at least one nonionic or anionic surfactant, **in claim 10**;

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wherein the nonionic surfactant is selected from the group consisting of fluoroalkyl surfactants, polyethylene glycols, polypropylene glycols, polyethylene ethers, polypropylene glycol ethers, carboxylic acid salts, dodecylbenzenesulfonic acid, dodecylbenzenesulfonic salts, polyacrylate polymers, dinonylphenyl polyoxyethylene, silicone polymers, modified silicone polymers, acetylenic diols, modified acetylenic diols, alkylammonium salts, modified alkylammonium salts, and combinations comprising at least one of the foregoing, **in claim 11**; and

wherein the nonionic surfactant comprises a modified acetylenic diol, **in claim 12**.

Wilkinson teaches acetylenic alcohols and diols have been utilized as non-ionic surfactants in cleaning applications (column 3, lines 18-21) and are contemplated to have utility in environmentally friendly cleaning operations (column 4, line 30-32 and column 5, lines 44-46), Wilkinson also teaches 0.01 to 30 wt % acetylene diol in CO₂ (column 4, lines 61-63). Hence, one can conclude the balance of CO₂ ranges from 99.09 to 70 wt %.

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Vaartstra's and Mullee's formulation by employing a surfactant as taught by Wilkinson for the purpose of using a material that is environmentally friendly.

5. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vaartstra (US '828) in view of Mullee (US 564 B1) and further in view of Wilkinson '505) as applied to claim 1 above.

Vaartstra in view of Mullee and Wilkinson differ in failing to teach wherein the etching composition comprises about 75.0 wt % to about 99.5 wt % SCF, about 0.3 wt % to about 22.5 wt % co-solvent, about 0.01 wt % to about 5.0 wt % etchant species,, based on the total weight of the composition, **in claim 13**.

However, Vaartstra in view of Mullee and Wilkinson illustrate the specific combination of a supercritical fluid, co-solvent, an etchant (bifluoride compound) species, and one surfactant in a composition is known. Hence, it would have been obvious to one having ordinary skill in the art at the time the invention was made to select any proportion of wt % of components in the combined references of Vaartstra, Mullee and Wilkinson that would accomplish the disclosed composition because it has been held that there is no invention where the difference in proportions is not critical and was ascertained by routine experimentation because the determination of workable ranges is not considered inventive. See *In re Swain and Adams*, 70 USPQ 412 (CPA 1946).

Response to Arguments

6. Applicant's arguments, see Remarks, filed 11/23/2005, with respect to the rejection(s) of claim(s) 1-7, 10-12, 14 and 15 and claim(s) 8, 9, 13, and 16, respectively under 35 §U.S.C. 102(e) and 35 §U.S.C. 103 (a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of newly found art which addresses applicants' claimed etching composition that "comprises at least one

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bifluoride compound selected from the group consisting of ammonium bifluoride and tetraalkylammonium bifluoride $((R)_4NHF_2)$, wherein R is a C₁-C₄ alkyl group, as recited in (currently Amended) claim 1.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 571-272-1470. The examiner is normally unavailable on the First Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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February 6, 2006

ON
EXAMINER

